Frequently Asked Questions:
Groundwater Level Comparison in Selected Water Wells Map

Question: **What does the *Groundwater Level Comparison in Selected Water Wells* map show about California's groundwater?**

Answer: The map compares fall 2008 groundwater elevations with two recent drought water periods; 1977-1978 and 1991-1992. The map provides a snapshot of groundwater elevation data for the Sacramento Valley and San Joaquin Valley. The groundwater level comparison map is an overview of selected wells for the period of record and does not represent all groundwater basins or groundwater conditions in California. On this map, the green dots represent wells with groundwater elevations that are above the 1977-1978 *and* 1991-1992 water years, the yellow dots represent wells with water levels that are about the same as the 1977-1978 *or* 1991-1992 water years, and the orange dots indicate wells with water levels that are below the 1977-1978 *or* 1991-1992 water years.

Question: **Why are some areas that rely upon groundwater not represented on this map?**

Answer: For the purposes of this map, only those wells that fit the initial selection criteria are shown. Data collection programs managed by DWR and their cooperating agencies have varied over the years. Wells have been added and removed from the monitoring network as budgets fluctuated, development occurred, and for various technical reasons. Efforts are currently underway to include more data points that meet the drought comparison criteria. This map will be updated as additional information becomes available.

Question: **Groundwater elevations have changed since fall 2008. Will the dots on the map be updated to show these changes?**

Answer: DWR is planning to measure the semi-annual wells in its monitoring network during March and April 2009. A new groundwater elevation map will be generated to show how the water elevations in the selected wells have responded to this winter's precipitation and snow melt. DWR measures groundwater elevations throughout the State on a monthly and semi-annual basis and presents that data to the public on its Water Data Library (WDL) website. Wells are usually measured during the fall when the water elevations are historically at their lowest and in the spring when the water elevations are historically at their highest.

- DWR Water Data Library (http://wdl.water.ca.gov/gw/)

Question: **Which are more important – groundwater elevations in aquifers or surface water levels in reservoirs – to measure the severity of a drought?**

Answer: Both are important. When there is a reduction in surface water deliveries from the reservoirs (i.e., reservoir levels are low), many municipalities rely upon groundwater to augment their supplies for potable, industrial, and agricultural purposes, especially in times of drought. In addition, many areas of California do not have access to surface water supplies and are solely reliant upon groundwater for consumption and irrigation. So, when there is little or no surface water available, or when the timing of precipitation is not ideal for agricultural purposes, groundwater is pumped and the depth to water in the wells gets deeper. By monitoring groundwater elevation trends and comparing these trends with other data sources, hydrogeologists can observe short-term and long-term impacts of groundwater withdrawal on aquifers.

- Sustainability of Ground-Water Resources (http://pubs.usgs.gov/circ/circ1186/)
- Ground-Water-Level Monitoring and the Importance of Long-Term Water-Level Data (http://pubs.usgs.gov/circ/circ1217/)

Question: **Does groundwater affect surface water?**

Answer: Groundwater and surface water are not two separate water sources. Although there are exceptions, surface water is hydraulically connected to groundwater; however, because we can see surface water, such as in reservoirs and in rivers, and we generally cannot observe water contained within aquifers, the interactions are complex to observe, measure, and explain. The timing of the hydraulic connection is also difficult to compare. While water levels in reservoirs and rivers can fluctuate immediately during rainfall and snowmelt runoff, water elevations in groundwater wells take time to react to changes in surface water. Because groundwater recovers more slowly after a drought than surface water, impacts to an aquifer system may take months or years to be realized, long after a drought is perceived to be over.

A groundwater basin can be called a groundwater reservoir because it operates like a surface water reservoir – if you take out more water than goes in, the water level in the reservoir declines. Groundwater reservoirs are recharged by precipitation, surface runoff, irrigation, in some cases by imported water, and by using surface water to irrigate in lieu of groundwater. When there is no rainfall or snowfall, no irrigation, and no source of imported water, there is no surface water to recharge the aquifers in the groundwater reservoir. DWR actively studies groundwater and surface water interactions to determine the extent of the hydraulic connections and sources of aquifer recharge.

- DWR Groundwater Information Center (http://www.groundwater.water.ca.gov/)
- Ground Water and Surface Water: A Single Resource (http://pubs.usgs.gov/circ/circ1139/)

Question: **How can there be green dots directly next to orange dots? How can one well be <u>above</u> historic drought levels and another nearby well be <u>below</u> historic drought levels?**

Answer: There is much spatial variability (i.e., horizontal and vertical) associated with aquifers, and depending on the depth of a groundwater well, separate aquifer systems may be encountered in the same area that are considered either unconfined, semi-confined, or confined. Unconfined aquifers are generally encountered at shallow depths below the ground surface, while confined aquifers are generally encountered at greater depths. Water levels in wells that tap separate aquifers can be drastically different, and will respond independently of each other when pumped. There are numerous inferred hydrogeological explanations based on real data sets that go into the analysis of aquifer systems; DWR is actively involved in characterizing the many aquifer systems throughout the State from both a water storage and water quality perspective.

- DWR Bulletin 118: California's Groundwater (http://www.groundwater.water.ca.gov/bulletin118/index.cfm)
- DWR Water Facts: Groundwater (http://www.dpla2.water.ca.gov/publications/waterfacts/water_facts_6.pdf)
- DWR Water Facts: Groundwater in Fractured Hard Rock (http://www.dpla2.water.ca.gov/publications/waterfacts/water_facts_1.pdf)

Question: **If I live near an orange dot and pump groundwater, how will my well be affected?**

Answer: Pumping more groundwater than usual from a local aquifer or from regional aquifers can drastically lower the water elevation in wells. There is a greater likelihood that some wells could start to become "dry" if the depth to groundwater is deeper than the depth of a pump intake or a well's screened interval. A well could be considered "dry" or unusable if: 1) the water from a well is actually drained; 2) the water level is lowered below existing equipment; 3) there is decreased discharge from the well causing a reduction in system pressure; or 4) over-pumping aquifers causes adverse water quality changes. Conversely, when less groundwater is pumped, or when surface water is used rather than groundwater and in-lieu recharge occurs, "dry" wells can be naturally recharged over time.

- DWR Water Facts: Yield of a Water Supply Well (http://www.dpla2.water.ca.gov/publications/waterfacts/water_facts_11.pdf)

Question: **What are the concerns if too much groundwater is pumped from California's aquifers?**

Answer: The impacts associated with pumping too much groundwater from California's aquifers depend on many factors, such as geographic location (saline intrusion), geologic material (land subsidence), water quality, ability of aquifers to be recharged by surface water (groundwater age, degree of aquifer confinement), and changing climate conditions. If too much groundwater is pumped near coastal areas, the cone of depression could induce or increase the rate of saline intrusion into freshwater aquifers. In hard rock aquifers, or fractured bedrock aquifers, too much pumping could de-water existing sources. In aquifers with fine-grained material (clays) or unconsolidated sediment, permanent land subsidence could occur which could cause damage to infrastructure, such as roads, buildings, and bridges, as well as canals and levees. In addition, over-pumping some aquifers could change water chemistry or mobilize existing groundwater contamination. To address these potential concerns, DWR promotes the development of groundwater management plans to proactively minimize the effect of groundwater use.

- Ground-Water Depletion Across the Nation (http://pubs.usgs.gov/fs/fs-103-03/)
- Land Subsidence from Ground-Water Pumping (http://water.usgs.gov/ogw/subsidence.html , http://geochange.er.usgs.gov/sw/changes/anthropogenic/subside/)
- Ground-Water Availability in the United States (http://pubs.usgs.gov/circ/1323/)

Question: **What is DWR doing to improve its knowledge of groundwater and improve groundwater storage reliability?**

Answer: DWR has been working for the last decade to implement additional groundwater storage through locally driven projects. As of December 2008, over $350 million dollars of State bond funds from Proposition 204, 13, and 50 have been dedicated to statewide groundwater storage and conjunctive water management programs, which were matched by over $1 billion dollars of local funds. Over 300,000 acre-feet of new water supply was developed from the Proposition 13 investments alone. Proposition 84 provides additional money for projects to improve water supply reliability, water quality, and the environment. Groundwater storage represents a significant portion of the projects that are implemented with these funds.

Managing groundwater to ensure a long-term sustainable and reliable, good quality water supply requires that local agencies implement a groundwater management program suitable to the political, legal, institutional, technical, and economic opportunities and constraints that exist in their groundwater basin. DWR provides grant funding to help local agencies prepare groundwater management plans.

- DWR Water Facts: Groundwater Management in California (http://www.dpla2.water.ca.gov/publications/waterfacts/water_facts_8.pdf)
- Overview of California Groundwater Management: Presentation to the Senate Natural Resources and Water Committee, March 10, 2009, by Mark Cowin, Deputy Director, DWR

Question: **Where can I find more information about groundwater in California?**

Answer: DWR has substantial information available to the public to better understand groundwater in California; however, despite California's heavy reliance upon groundwater, basic information for many of the State's groundwater basins is lacking. The DWR, the State Water Resources Control Board, the United States Geological Survey, and many other scientific organizations study groundwater in California. Listed below are several internet links to groundwater information:

- DWR Groundwater Information Center (http://www.groundwater.water.ca.gov/)
- USGS Ground Water Information Pages (http://water.usgs.gov/ogw/)
- State Water Resources Control Board (http://www.waterboards.ca.gov/water_issues/programs/gama/)
- Groundwater Resources Association of California (http://www.grac.org/)
- California Groundwater Association (http://www.groundh2o.org/)
- National Ground Water Association (http://www.ngwa.org/)
- Association of Groundwater Agencies (http://www.agwa.org/)